

1949. Records and descriptions of North American crane-flies (Diptera). Part VIII. The Tipuloidea of Washington, I. Amer. Midland Natur., 42: 257-333, 65 figs.
- HYNES, C. D. 1963. Description of the immature stages of *Cryptolabis magnistyla* Alexander (Diptera: Tipulidae). Pan-Pac. Entomol., 39: 255-260.

An Annotated Bibliography of Literature on Salt Marsh Insects and Related Arthropods in California

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The Pacific Coast Entomological Society in 1966 established a special committee whose concern was to be "the salt marsh habitat." The Society voted to undertake the encouragement of the publication of notes and observations of insects and other related arthropods of the salt marsh, particularly of central California.

In order to facilitate such work, the following annotated bibliography is presented.

Standard references, indexes and abstracts were employed in developing this bibliography. Only references appropriate to California are included in this manuscript. An extended series of references on salt marsh arthropods are on file at the Entomology Departments of the California Academy of Sciences in San Francisco and at San Francisco State College. This bibliographic file will be kept as current as possible.

The greatest share of the references in the literature refer to European salt marshes. It is our opinion that a considerable body of information exists in the literature relating to the species of terrestrial arthropods inhabiting the salt marsh environment. However, most of these sources of information are not available to a search based upon words or phrases indicating the specific habitat. That is, the bulk of the information extant is contained within taxonomic articles, the titles of which do not disclose the habitats of the species treated.

Readers are encouraged to submit additional references based upon their familiarity with the taxonomic literature so that we may expand what we know to be only a first approximation of the existing information on the terrestrial arthropods of the salt marsh habitat.

- AARONS, T. 1953. Salt marsh mosquito survey in the San Francisco Bay Area, 1950-53. Proc. Calif. Mosquito Control Assoc., 22: 75-78.
(A survey of *Aedes squamiger* in S. F. Bay marshes.)

- AARONS, T., J. R. WALKER, H. F. GRAY, AND E. G. MEZGER. 1951. Studies of the flight range of *Aedes squamiger* (Coquillet). Proc. Calif. Mosquito Control Assoc., 19: 65-71.
(Contains flight records on *A. squamiger* and *A. dorsalis* in S. F. Bay Region.)
- BLACKWELDER, R. E. 1932. The genus *Endeodes* LeConte. Pan-Pacific Entomol., 8: 128-136.
(Melyrid beetles collected from San Francisco to San Diego near high tide mark in damp areas under rubbish are described. Biological notes on each are included.)
- BOHART, R. M. 1948. Differentiation of larvae and pupae of *Aedes dorsalis* and *Aedes squamiger*. Proc. Entomol. Soc. Wash., 50: 216-217.
1956. Identification and distribution of *Aedes melanimon* and *Aedes dorsalis* in California. Proc. Calif. Mosquito Control Assoc., 24: 81-83.
(Distinctions based upon larval characters and male genitalia provide identification of the two species. *A. dorsalis* primarily coastal southeastern, eastern and northeastern in its distribution in Calif. *A. melanimon* primarily central valley in Calif. and with populations in coastal southern Calif. northeastern and eastern; extending east to Colorado and north to Oregon and Montana.)
- BOHART, R. M., E. C. MEZGER, AND A. D. TELFORD. 1953. Observations on the seasonal history of *Aedes squamiger*. Proc. Calif. Mosquito Control Assoc., 21: 7-9.
(Contains egg-pupal development during fall to spring months of a marsh near Bolinas, California.)
- CARL, G. A. 1937. Flora and fauna of brackish water. Ecology, 18: 446-453. 1 map, 2 graphs.
(A brackish water community located at the entrance to Stanley Park, Vancouver, B. C., contains water-boatmen, damsel fly nymphs, and midge fly larvae in large numbers in the mud.)
- CARPELAN, L. H. 1957. Hydrobiology of the Alviso Salt Ponds. Ecology, 38: 375-390.
(Discusses ecology of six salt ponds. Presents observations on physical, chemical and biological factors. Lists species of all life (plant, vertebrate and invertebrate) in ponds 1-6 with increasing salinities. Pond 1 contains brackish bay water. Pond 6 contains water about four times that of ocean water.)
- CARPENTER, S. J., W. W. MIDDLEKAUFF, AND R. W. CHAMBERLIN. 1946. The mosquitoes of the southern United States east of Oklahoma and Texas. Amer. Midland Natur., Monogr. 3, 292 pp.
(*Aedes taeniorhynchus* occurs along the Pacific Coast from Peru to California, and breeds in salt marshes flooded by tides or rains. The following are also salt marsh breeders: *Aedes dorsalis*, *A. sollicitans*, *Culex salinarius*, *C. bahamensis*, *Anopheles atropos*, and *A. crucians bradleyi*.)
- CHAMBERLIN, J. C., AND G. F. FERRIS. 1929. On Liparocephalus and allied genera. Pan-Pac. Entomol., 5: 137-143, 153-162.
(Four species of staphylinid beetles taken from the reefs of Moss Beach, California, are described in terms of their biology, morphology,

and taxonomy. All species were found in rock crevices and under algae, extending out to about the half-tide mark.)

CHAPMAN, H. C., AND G. GRODHAUS. 1963. The separation of *Aedes dorsalis* Meigen and *A. melanimon* Dyar. Calif. Vector Views, 10: 53-56.

(Description of taxonomic characters that can be used to separate adult females of these two insects. Specimens studied were obtained from larval samples taken from salt marshes in the Eureka area of Humboldt Co.)

COQUILLET, D. W. 1902. New Diptera from North America. Proc. U. S. Nat. Mus., 25: 83-126.

DE LA TORRE-BUENO, J. R. 1913. Some new and little-known Heteroptera from the Western United States. Entomol. News, 24: 20-23.

(*Gerris gillettei* L. and S. taken from Garfield, Utah, on brackish water.)

DODDS, C. T. 1923. A new salt marsh mealy bug (*Eriococcus palustris*). J. Entomol. and Zool., 15: 57-60.

(Description and biology of *E. palustris* Dodds (Homo.) occurring on the upper surface of the leaves of salt-marsh cord-grass (*Spartina foliosa* Trin.) in the San Francisco Bay region. *Pseudococcobius clauseni* Timberlake (Hymen.) parasitized a large percentage of them.)

ESSIC, E. O. 1926. Insects of Western North America. The MacMillan Co., New York, 1035 pp.

(Specific references: (1) sugar beet leaf-hopper (Homo.), *Eutettix tenellus* (Baker), found on annual saltbushes (p. 212); (2) Cord grass scale (Homo.), *Chionaspis spartinae* Comstock, abundant on cord or salt marsh grass around S. F. Bay region (p. 310). (3) *Pseudococcus salinas* (Cockerell), coastal area of Calif. on salt marsh grass (p. 284-Homo.); (4) *P. timberlakei* Cockerell (Homo.)—S. F. Bay region on salt marsh grass; (5) Yucca mealybug, *Puto ambigua* (Fullaway): infests pickleweed in S. F. Bay region (p. 286-Homo.); (6) *Trirhabda flavolimbata* (Menn): this Chrysomelid (Col.) is a general feeder on pickleweed in Calif. (p. 472); (7) *Gerris gillettei* Lethierry and Severin (Hemip.): Western sp. occurring in Calif., Utah, Montana, and Colorado. Reported in brackish water in the latter (p. 364); (8) littoral shore bug, *Salda littoralis* (Linn.): frequent damp and wet areas in marshes, near the shores of streams and ponds in Calif. (p. 365 Hemip.): (9) the brown salt marsh mosquito, *Aedes dorsalis* (Meigen): larvae live in salt marshes and other habitats. Common and troublesome along the Pacific Coast from Calif. to British Columbia (p. 537-Dipt.); (10) Calif. salt marsh mosquito, *Aedes squamiger* (Coquillett): larvae inhabit salt marshes and tide pools along coast of middle and Southern Calif. (p. 538-Dipt.); (11) *Aedes taeniorhynchus* (Wiedemann): reported only from Southern Calif. in West. Larvae live in brackish tide pools along the coast (p. 538-Dipt.); (12) *Ephydra millbrae* Jones: swarms over surface of brackish water pools in S. F. Bay region (p. 609-Dipt.: Ephydridae); (13) *Ephydra viridis* (Hine)—salt marshes of S. F. Bay region (p. 609-Dipt.); (14) *Scatella intermedia* Cresson, Jr.: salt marshes of S. F. Bay region. Nothing known concerning larval habits (p. 609-Dipt.).)

- FERRIS, G. F. 1918. The California species of mealy bugs. Stanford Univ. Publ., Univ. Ser., 78 pp.
 (Morphology of *Trionymus distichlii* Ferris distributed along the Pacific Coast of Calif. on the leaves or in the axils of salt marsh grass (*Distichlis spicata*)—pp. 69–70. Often associated with *Pseudococcus salinas* (Cockerell) pp. 52–53, and *P. timberlakei* Ckll.—p. 54. The latter is known only from the San Francisco Bay region.)
- HORN, G. H. 1893. The Galerucini of Boreal America. Trans. Amer. Entomol. Soc., 20: 57–144.
 (*Trirhabda* spp. are covered on pages 63 to 73. Description of *T. flavolimbata* (Mann), a general feeder on pickleweed in Calif. and southern Oregon (Coleoptera).)
- HUTCHINSON, G. E. 1931. On the occurrence of *Trichorixa* Kirkaldy (Corixidae, Hemiptera-Heteroptera) in salt water and its zoogeographical significance. Amer. Natur., 65: 573–574.
 (A single species of *Trichorixa* Kirkaldy (*T. Wallengreni*) ranges across the Pacific from California to China.)
- JONES, B. J. 1906. Catalogue of the Ephydridae, with bibliography and description of new species. Univ. Calif. Publ., Tech. Bull., Entomol., 1: 153–198.
 (Description of *Ephydra millbrae* which is quite common along the southwest shore of San Francisco Bay (esp. about Millbrae). They breed in salt marsh pools relatively unaffected by the tide and with a salinity value often much greater than that of the bay itself (up to 4.2%). Puparia frequently parasitized by Chalcid flies as they float on the water surface attached to pieces of vegetation.)
- LOWE, H. J. 1932. Observations on the breeding habits of *Aedes squamiger*. Proc. 3d Ann. Conf. Mosquito Abt. Offic. Calif., paper no. 1.
- LUXTON, M. 1964. Some aspects of the biology of salt-marsh Acarina. Acarologia, fasc. h. s.
 (Contains a good introduction to ecology of salt-marsh Acarina, based upon studies in South Wales.)
- MULHERN, T. D. 1963. Mosquito control technology in wildlife areas. Calif. Vector Views, 10: 39–42.
 (The coastal tidal marshes about San Francisco Bay represent one of the wildlife areas of concern to mosquito control workers in Calif., and as such it is recommended that natural control methods be sought where insecticidal control may be impractical. Principally concerned with *Aedes dorsalis*.)
- SAUNDERS, L. G. 1928. Some marine insects of the Pacific Coast of Canada. Ann. Entomol. Soc. Amer., 21: 521–545.
 (Taxonomy and biology of 8 species of intertidal insects (Dipt. & Col.) collected on the West Coast of British Columbia. Larvae and pupae were found in the algal growths on the rocks, or swarming nearby when the tide was receding.)
- SMITH, L. M., AND H. LOWE. 1948. The black gnats of California. Hilgardia, 18: 157–183.
 (The Bodega black gnat, *Holoconops kerteszi* Kieffer, spends its larval stage in damp sand at or slightly above high-tide level at the borders

of brackish water pools (where the salt concentration of the sand is roughly 640 ppm). Adults emerge from mid-April until early October, and feed on man, domestic animals, and birds.)

- VAN DYKE, E. C. 1918. New inter-tidal rock-dwelling Coleoptera from California. *Entomol. News*, 29: 303-308.

(Description of three new species of beetles collected along the Calif. Coast in the crevices of rocks so situated that they are submerged by high tides (Carabidae: *Thalassotrechus nigripennis*; Hydrophilidae: *Ochthebius lapidicolis*; Eurystethidae: *Eurystethes subopacus*.)

- WIRTH, W. W. 1949. A revision of the clunionine midges with descriptions of a new genus and four new species (Diptera: Tendipedidae). *Univ. Calif. Publ. Entomol.*, 8: 151-182.

(The following species are reported from the California coast: *Eretmoptera browni* Kellogg, *Tethymyia aptena* Wirth, *Telmatogeton macswaini* Wirth, *Paraclunio trilobatus* Kieffer, and *Paraclunio alaskensis* (Coquillett).)

To assist readers wishing to know more about the salt marsh community, the additional references are offered as an introduction into the literature of the salt marsh habitat.

- CHAPMAN, V. J. 1960. Salt Marshes and Salt Deserts of the World. Interscience Pub. Inc., N. Y., pp. 392, figs. and photos.

(Contains taxonomic and ecological treatments of plants and dynamics of salt marsh and saline habitats.)

- HEDGPETH, J. W. 1957. Treatise on Marine Ecology and Paleoecology. *Geol. Soc. Amer. Memoir* 67, 1296 pp.

(An outstanding treatment of all phases of shore, estuarine, sand, mudflat, and marsh studies.)

- HINDE, H. P. 1954. The vertical distribution of salt marsh phanerogams in relation to tide levels. *Ecol. Monogr.*, 24: 209-225.

(The vertical distribution of three major seedplants from a salt marsh on San Francisco Bay is controlled by the degree of tidal emergence and submergence to which they are subjected.)

- LAUFF, G. H. 1967. Estuaries. Report 10, Amer. Assn. Advance. Sci., 776 pp.

(An excellent treatment of the dynamics of estuarine biology.)

- MASON, H. L. 1957. A Flora of the Marshes of California. *Univ. Calif. Press*, Berkeley, p. 878.

(Primary emphasis is on lowland marsh plants of California.)

- PURER, E. A. 1942. Plant ecology of the coastal salt marshlands of San Diego County, California. *Ecol. Monogr.*, 12: 82-95.

(Nine species of salt marsh plants from 12 stations located in San Diego Co. were studied as to their distribution, habitat, and individual characteristics.)